Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

1501 Issued April 28, 1913.

U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 527.

Experiment Station Work, LXXIV.

Compiled from the Publications of the Agricultural Experiment Stations.

JANUARY, 1913.

PREPARED IN THE OFFICE OF EXPERIMENT STATIONS.
A. C. TRUE, Director.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1913.

THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—
College Station: *Auburn*; J. F. Duggar.[1]
Canebrake Station: *Uniontown*; L. H. Moore.[1]
Tuskegee Station: *Tuskegee Institute*; G. W. Carver.[1]
ALASKA—*Sitka*: C. C. Georgeson.[2]
ARIZONA—*Tucson*: R. H. Forbes.[1]
ARKANSAS—*Fayetteville*: C. F. Adams.[1]
CALIFORNIA—*Berkeley*: T. F. Hunt.[1]
COLORADO—*Fort Collins*: C. P. Gillette.[1]
CONNECTICUT—
State Station: *New Haven*;
Storrs Station: *Storrs*;
} E. H. Jenkins.[1]
DELAWARE—*Newark*: H. Hayward.[1]
FLORIDA—*Gainesville*: P. H. Rolfs.[1]
GEORGIA—*Experiment*: Martin V. Calvin.[1]
GUAM—*Island of Guam*: J. R. Thompson.[2]
HAWAII—
Federal Station: *Honolulu*; E. V. Wilcox.[2]
Sugar Planters' Station: *Honolulu*; C. F. Eckart.[1]
IDAHO—*Moscow*: W. L. Carlyle.[1]
ILLINOIS—*Urbana*: E. Davenport.[1]
INDIANA—*La Fayette*: A. Goss.[1]
IOWA—*Ames*: C. F. Curtiss.[1]
KANSAS—*Manhattan*: W. M. Jardine.[1]
KENTUCKY—*Lexington*: J. H. Kastle.[1]
LOUISIANA—
State Station: *Baton Rouge*;
Sugar Station: *Audubon Park, New Orleans*;
North La. Station: *Calhoun*;
Rice Station: *Crowley*;
} W. R. Dodson.[1]
MAINE—*Orono*: C. D. Woods.[1]
MARYLAND—*College Park*: H. J. Patterson.[1]
MASSACHUSETTS—*Amherst*: F. W. Morse.[1]
MICHIGAN—*East Lansing*: R. S. Shaw.[1]
MINNESOTA—*University Farm, St. Paul*: A. F. Woods.[1]
MISSISSIPPI—*Agricultural College*: E. R. Lloyd.
MISSOURI—
College Station: *Columbia*; F. B. Mumford.[1]
MISSOURI—Continued.
Fruit Station: *Mountain Grove*; Paul Evans.[1]
MONTANA—*Bozeman*: F. B. Linfield.[1]
NEBRASKA—*Lincoln*: E. A. Burnett.[1]
NEVADA—*Reno*: G. H. True.[1]
NEW HAMPSHIRE—*Durham*: J. C. Kendall.[1]
NEW JERSEY—*New Brunswick*: J. G. Lipman.[1]
NEW MEXICO—*State College*: Luther Foster.[1]
NEW YORK—
State Station: *Geneva*; W. H. Jordan.[1]
Cornell Station: *Ithaca*; L. H. Bailey.[1]
NORTH CAROLINA—
College Station: *West Raleigh*;
State Station: *Raleigh*;
} H. W. Gilmore.[1]
NORTH DAKOTA—*Agricultural College*: J. H. Worst.[1]
OHIO—*Wooster*: C. E. Thorne.[1]
OKLAHOMA—*Stillwater*: J. A. Wilson.[1]
OREGON—*Corvallis*: J. Withycombe.[1]
PENNSYLVANIA—
State College: R. L. Watts.[2]
State College: Institute of Animal Nutrition, H. P. Armsby.[1]
PORTO RICO—
Federal Station: *Mayaguez*; D. W. May.[2]
Sugar Planters' Station: *Rio Piedras*; J. T. Crawley.[1]
RHODE ISLAND—*Kingston*: B. L. Hartwell.[1]
SOUTH CAROLINA—*Clemson College*: J. N. Harper.[1]
SOUTH DAKOTA—*Brookings*: J. W. Wilson.[1]
TENNESSEE—*Knoxville*: H. A. Morgan.[1]
TEXAS—*College Station*: B. Youngblood.[1]
UTAH—*Logan*: E. D. Ball.[1]
VERMONT—*Burlington*: J. L. Hills.[1]
VIRGINIA—
Blacksburg: S. W. Fletcher.[1]
Truck Station: *Norfolk*; T. C. Johnson.[1]
WASHINGTON—*Pullman*: R. W. Thatcher.[1]
WEST VIRGINIA—*Morgantown*: E. D. Sanderson.[1]
WISCONSIN—*Madison*: H. L. Russell.[1]
WYOMING—*Laramie*: H. G. Knight.[1]

[1] Director. [2] Special agent in charge. [3] Acting director.

EXPERIMENT STATION WORK.

Edited by W. H. Beal and the Staff of Experiment Station Record.

Experiment Station Work is a subseries of brief popular bulletins compiled from the published reports of the agricultural experiment stations and kindred institutions in this and other countries. The chief object of these publications is to disseminate throughout the country information regarding experiments at the different experiment stations, and thus to acquaint farmers in a general way with the progress of agricultural investigation on its practical side. The results herein reported should for the most part be regarded as tentative and suggestive rather than conclusive. Further experiments may modify them, and experience alone can show how far they will be useful in actual practice. The work of the stations must not be depended upon to produce "rules for farming." How to apply the results of experiments to his own conditions will ever remain the problem of the individual farmer.—A. C. True, Director, Office of Experiment Stations.

CONTENTS OF NO. LXXIV.

ILLUSTRATIONS.

EXPERIMENT STATION WORK.[1]

PEONIES.[2]

The peony is one of many old-time flowers which have experienced a decided modern improvement and revival of popularity. This is shown by the recent rapid growth of its culture and by the larger number of varieties that are being originated and propagated by the trade. The American Peony Society has for several years been cooperating with the Cornell Experiment Station in the study of the

FIG. 1.—Field of peonies in which studies of synonymy were made.

nomenclature and classification of the peony (fig. 1), and the station has recently issued its fourth report on this work. This and previous reports give descriptions of 626 varieties, including probably 95 per cent of the important commercial varieties. Those in charge of this

[1] A progress record of experimental inquiries published without assumption of responsibility by the department for the correctness of the facts and conclusions reported by the stations.

[2] Compiled from New York Cornell Sta. Buls. 259, 278, 300.

work have, however, been strongly "impressed with the large number of only medium varieties which are being continually originated and propagated by the trade."

It is probably a conservative statement to say that the peony interests of the country would be better off if about 75 per cent of the varieties were destroyed and future propagation made from the remaining 25 per cent of superior varieties. It is not that these 75 per cent of the varieties are positively unattractive; far from it. But the remaining 25 per cent fill every purpose and have many more virtues than the only medium to inferior sorts. By discarding the mediocre or poor sorts and selling only the more desirable varieties the customers would be even more infatuated with this beautiful flower, and a more extensive and higher-class trade would be built up, to the benefit of all concerned.

Varieties recommended for cut flowers and landscape or border planting are as follows:

LIST OF VARIETIES RECOMMENDED BY THE AMERICAN PEONY SOCIETY.

For Cut Flowers.

White.—Festiva Maxima, Couronne d'Or, Duchesse de Nemours, Baroness Schroeder, Albatre, Alba Sulfurea, Madame Crousse, Madame Calot, Madame de Vernéville, Boule de Neige, Avalanche, and Duc de Wellington.

Pale pink.—Achille, Albert Crousse, Dorchester, Floral Treasure, La Perle, Madame Lemoine, Marguerite Gérard, Marie d'Hour, Miss Salway, Mademoiselle Léonie Calot, Madame Émile Gallé, and Venus.

Pink and white.—Gloire de Charles Gombault, La Tulipe, and Jeanne d'Arc.

Deep pink.—Madame Ducel, Lamartine, Monsieur Jules Elie, Livingstone, Monsieur Boucharlat aîné, Souvenir de l'Exposition Universelle, Madame Lebon, Général Bertrand, Modeste Guérin, Edulis Superba, Alexandre Dumas, Madame Muyssart, and Kelway's Queen.

Red.—Félix Crousse, Louis Van Houtte, and Henry Demay.

Deep red.—Delachei, Prince de Talindyke (?), Constant Devred, Nigricans, Madame Becquet, Pierre Dessert, and Rubra Superba.

For Landscape.

White.—Octavie Demay, Marie Jacquin, Baroness Schroeder, Albâtre, Duchesse de Nemours, Alice de Julvécourt, Madame de Vernéville, Festiva, Marie Lemoine, Couronne d'Or, Madame Bréon, La Rosière, Albiflora the Bride, Avalanche, and Festiva Maxima.

Pale pink.—Achille, Eugène Verdier, Eugénie Verdier, Dorchester, Floral Treasure, Marie d'Hour, Triomphe de l'Exposition de Lille, Venus, La Perle, Marie Crousse, and James Kelway.

Pink and white.—Embellata Roseæ, Golden Harvest, Madame Costé, Madame de Vatry, Thérèse, Princess Beatrice, Beauté Française, and Philoméle.

Deep pink.—Madame Ducel, Livingstone, Monsieur Boucharlat aîné, Souvenir de l'Exposition Universelle, Madame Lebon, Général Bertrand, Modeste Guérin, Edulis Superba, Madame Muyssart, Alexandre Dumas, and Modèle de Perfection.

Red.—Fulgida, Félix Crousse, Augustin d'Hour, Louis Van Houtte, De Candolle, Henry Demay, and Dr. Caillot.

Deep red.—Delachei, Monsieur Martin Cahuzac, Stanley (Kelway), Raphael, Madame Becquet, and Adolphe Rousseau.

ADVANTAGES OF SPRAYING POTATOES.[1]

Potato growers have long realized that in seasons when blight is present spraying will check the blight and considerably increase the yield, but some growers have doubted that spraying is profitable on the average. It is impossible to foretell the appearance of blight, but since the disease generally does not appear every year, the tendency has been not to spray regularly in the belief that the aggregate gains will not repay the expense of spraying for a series of years. The 20 years' potato-spraying experiments at the Vermont station and 10 years of similar work at the New York State station recently completed answer the question as to the profitableness of spraying potatoes regularly in the affirmative and show such a margin of profit therefrom that the subject should command the earnest consideration of all potato growers.

In a previous bulletin of this series[2] attention was called to the work at the New York State station. The work at the Vermont station was begun in 1891. In the early experiments comparative tests of different fungicides were made, but the superiority of Bordeaux mixture soon became apparent, and in the subsequent years Bordeaux alone was used. The results showed conclusively that Bordeaux mixture very efficiently protected plants from the attacks of the early and of the late blight and seemed to serve in some way as a stimulus to the plant, so that it remained green from one to two weeks longer than the unsprayed plants and also yielded more and larger tubers.

The physiological effect on the plant is shown by the fact that even early in the season the sprayed plants stored more starch in their tubers than those not so treated. While the plants themselves from the sprayed and the control plats were of approximately the same size, "the weight of the tubers at this time was 24.8 bushels per acre in favor of the potatoes to which the Bordeaux had been applied. This would seem to indicate that during the months of July and August, while the tubers were growing, the unsprayed plants were not

[1] Compiled from New York State Sta. Bul. 349 (and 349, popular edition); Vermont Sta. Bul. 159.

[2] U. S. Dept. Agr., Farmers' Bul. 251, p. 9.

able to fix as much carbon dioxid and transform it into starch as were those that had not been so treated."

The results of the entire 20 years' work at the Vermont station show that—

Bordeaux mixture, even in years like 1910 when no blight occurs, increases the yield of the plants to which it is applied. This increased yield is always sufficient to pay for the cost of spraying operations. Spraying is to be regarded as an insurance that pays for itself. If the blights are prevalent, the potatoes, if thoroughly sprayed, are insured against loss therefrom; if the season is a dry one and no disease occurs, still the crop will be enough larger to pay for all the cost of spraying. The careful potato sprayer wins either way, no matter what the weather or disease conditions.

The results with iron sulphate-copper sulphate mixture indicate that Bordeaux mixture "in which part of the copper is replaced by iron has as great a stimulating effect as does the ordinary Bordeaux. Whether it is as good a fungicide has not yet been proved."

The increased yields from plats where the Bordeaux mixture was applied only to part of each plant indicates that even here there was a sufficient effect produced to manifest itself in a yield of 28 bushels per acre more than that obtained on the plats left entirely untreated. This is about what would be expected if half the leaves were touched by the Bordeaux.

The following table gives the results of the 20 years' spraying experiments, showing yields from the plats sprayed with Bordeaux mixture as compared with the control plats:

Gains from the use of Bordeaux mixture on late potatoes.

Planted.	Sprayed.	Yield per acre.		Gain per acre.		Prevalence of late blight.
		Sprayed.	Not sprayed.			
		Bushels.	*Bushels.*	*Bushels.*	*Per cent.*	
White Star:						
May —, 1891	Aug. 26, Sept. 8	313	248	65	26	Some.
May 20, 1893	Aug. 1, 16, 29	291	99	192	194	Much.
Do	do	338	114	224	196	Do.
Apr. 26, 1894	June 16, July 17, Aug. 30	323	251	72	29	None.
May 20, 1895	July 25, Aug. 13, 31	389	219	170	78	Rot.
Polaris:						
May 15, 1896	Aug. 7, 21	325	207	68	26	None.
June 1, 1897	July 27, Aug. 17, 28	151	80	71	89	Some.
White Star: May 10, 1898	July 21, Aug. 10	238	112	126	112	Little.
Average: 3 varieties, May 18, 1899.	July 26, Aug. 17, Sept. 8	229	161	68	42	Do.
Delaware:						
May 23, 1900	Aug. 4, 23	285	225	60	27	Rot.
May 25, 1901	July 20, Aug. 21	170	54	116	215	Much.
May 15, 1902	Aug. 1, 20	268	164	134	82	Severe.
Green Mountain: May 1, 1903	Aug. 10	361	237	124	52	Do.
Delaware:						
May 25, 1904	Aug. 1, Sept. 1	327	193	134	69	Some.
May 15, 1905	Aug. 2, 21	382	221	161	73	Severe.
Green Mountain:						
May 27, 1906	Aug. 13, 22	133	101	32	32	Some.
May 1, 1907	July 16, 25, Aug. 8, 22	171	63	108	175	Little.
May 15, 1908	June 26, July 9, Aug. 6, 26	150	59	91	140	None.
May 28, 1909	July 12, 23, Aug. 6, 27	243	188	55	29	Do.
May 9, 1910	July 11, 27, Aug. 15, 23, 30	240	202	38	18	Do.
	Average for 20 years	268	163	105	64	

In applying the mixture it is important to cover the plants uniformly and very thoroughly. The following directions for spraying are given by the New York State station:

In general commence spraying when the plants are 6 to 8 inches high and repeat the treatment at intervals of 10 to 14 days, in order to keep the plants well covered with Bordeaux throughout the season. During epidemics of blight it may be advisable to spray as often as once a week. Usually six applications will be required. The Bordeaux should contain 4 pounds of copper sulphate to each 50 gallons in the first two sprayings and 6 pounds to 50 gallons in subsequent sprayings. Whenever [potato] bugs or flea-beetles are plentiful add 1 or 2 pounds of Paris green, 2 quarts of arsenite of soda stock solution or 3 to 5 pounds of arsenate of lead to the quantity of Bordeaux required to spray an acre.

Thoroughness of application is to be desired at all times, but is especially important when flea-beetles are numerous or the weather favorable to blight. The more frequently and thoroughly the plants are sprayed the better. There is no danger of injuring the foliage by too much spraying. Using the same quantity of Bordeaux, frequent light applications are likely to be more effective than heavier applications at long intervals; that is, when a horsepower sprayer carrying but one nozzle per row is used, it is better to go over the plants once a week than to make a double spraying once in two weeks. In the first two sprayings, while the plants are small, one nozzle per row may be sufficient, but when the plants become large at least two nozzles per row should be used. Large vines are especially liable to blight and should be sprayed very thoroughly. Such vines will be somewhat injured by the wheels of the sprayer, but the benefit from spraying will far outweigh the damage done.

A single spraying is better than none and will usually be profitable, but more are better. Spraying may prove highly profitable, even though the blight is only partially prevented. It is unsafe to postpone spraying until blight appears. Except, perhaps, on small areas, it does not pay to apply poison alone for bugs. When it is necessary to fight insects Bordeaux mixture and poison should be used together. For the best results spraying should be continued as long as the plants live. It is a mistake to discontinue spraying because the weather is dry and no blight present. A late attack of blight may result in heavy loss from rot. As a rule those who spray most obtain the largest net profit.

The foregoing statements show that thorough spraying of potatoes every year has three distinct advantages which make it profitable: (1) It insures against loss from blight; (2) it protects against insect damage; and (3) it stimulates the growth and thus increases the yield.

MARKETING WOOL.[1]

An adequate knowledge of the requirements of the market and attention to those requirements are necessary in order to obtain the best prices for any commodity, and this applies just as much to the sale of wool as to any other branch of trade. The common practice of selling wool to local storekeepers, who are compelled to pay as

[1] Compiled from Illinois Sta. Circ. 161; Mo. Cons. and Trade Bpts. [U. S.], 1910, No. 357, pt. 2, p. 207.

much to one man as to his neighbor, irrespective of the value of the wool, and the consequent lack of knowledge on the part of the wool producer of the requirements of the market, have been great drawbacks to the proper development of the wool industry in this country. All kinds and grades of fleeces are sold in the same bag, resulting in a mixed and undesirable lot of wool. The commission merchant samples and buys the whole consignment on the basis of the cheapest and most inferior wool, and besides often discounts the seller for mixed packing. The producer suffers the loss.

It would seem, therefore, that any suggestions as to the proper preparation of the wool product for the market would be of particular value. As W. C. Coffey, of the Illinois station, points out—

> In these days we, as producers of wool, are absolutely dependent on the market for the disposal of our product. The day of homespun is gone. The world supply of wool is limited to such an extent that we may be confident of receiving a profitable return on our wool crop if we only do our share in meeting market requirements. • • •
>
> Those familiar with the ways of growing and preparing wool for market in the countries of greatest production admit that the United States is behind in her methods. Since the wools produced in the farm flocks of the central and eastern parts of our country come in direct competition with foreign wools, carefully grown and prepared for market, better methods are imperative if satisfactory profits are to be made on the wool crop.

The breeding, feeding, and general health of the flock are, of course, very important factors in determining the quality of the wool. In general it may be said that the English Down mutton breeds, such as the Shropshire, Oxford, and Hampshire, produce wool which will meet with ready demand, so that the specialized wool-producing breeds need not necessarily be chosen. By using pure-bred rams of the same breed for a series of years a flock can be graded up so that the type of wool will be sufficiently uniform to satisfy the demands of the market, provided proper attention is paid to the fleeces of the rams purchased and of the ewes reserved for breeding.

One of the most general criticisms made against the wools produced in farm flocks is in regard to the foreign substances the fleeces contain.

> Some of these substances get into the wool while it is on the sheep, while others gain entrance through faulty methods of shearing and packing. If there is a great deal of foreign material in wool, it is impossible to remove all of it through the process of scouring. If it is left in, the result is a fabric with noticeable defects; if it is removed, it is by treating with a weak solution of sulphuric acid and heating (a process known as carbonizing), which may weaken the wool fibers. This not only lowers the value of the wool for manufacturing purposes, but also adds to its cost to the manufacturer, because he has to spend upon it the extra labor of carbonizing. • • •
>
> Carelessness in feeding causes a great deal of foreign material to be deposited in wool. Hacks for roughages such as hay, fodder, and straw, should

be constructed so that chaff can not fall out and lodge on the shoulders and necks of the sheep. Barns and lots should be arranged so that it is unnecessary to pass amongst the sheep in carrying loose straw to the racks. It is well to remember that the equipment necessary to keep chaff and litter out of the wool, as suggested above, also results in a saving of feed. Usually that which sifts out and is lost is the most palatable and nutritious part of the feed; hence there is good reason for keeping it out of the fleece aside from the damage it does to the wool.

Care should be taken to keep dirt and dung out of the wool; neither of these damages wool as much as burrs, chaff, and litter, but they do some damage, and they most certainly make it less attractive to the buyer and add to the shrinkage in the process of scouring. Sheep should not be forced to lie in mud, nor should they be allowed to lie in dusty places. Those who run their sheep on plowed lands have difficulty in providing clean resting places for them, and we can not expect the wool to be as clean as it would be were their sheep kept on pastures. Tags of dung in wool are very objectionable to buyers. They are very heavy, and since they usually contain much moisture they often cause the wool to mold. There is no excuse for wrapping dung tags in wool if proper care is taken at shearing time, but it is better to handle sheep so that comparatively little dung will cling to the wool. All the sheep in the flock should be docked, and, late in the autumn, the wool should be sheared off around the dock. Dung clings to the wool only when the feces are soft or when the animal is scouring. When the animal scours it should have a change of feed and possibly medical attention, so that a case of chronic scours will not develop. If these suggestions are put into practice, there are not likely to be many dung tags at shearing time.

PAINT AND TAR MARKS.

Oil paint and tar marks are very objectionable in wool, but their use is not common in farm flocks. They are objectionable because they can not be removed in scouring. The manufacturer is obliged to employ labor to cut them out before the wool is scoured. This reduces the length of the wool to such extent that its value is impaired. The paint and tar clippings are of very low value, and hence the objection to them is thrice emphasized. In case it is desirable to wool brand, there are marking inks or fluids on the market which do no damage to the wool, because they come out in the process of scouring.

This subject is more fully discussed in a previous bulletin of this series.[1]

SHEARING.

The quality of the fleece depends to some extent upon the time of shearing, early shearing (in March) being preferable if practicable. Careful shearing in a clean place to secure clean, uniformly cut, untorn fleeces is another requisite of quality.

TYING THE FLEECE.

After shearing, the next important step is tying the fleece. Several things must be done to make this job a good one. First, all tag locks must be removed whether they be of dung or grease and dirt. Second, the fleece should be carefully rolled up by hand (not in a wool box), with no ends and stray locks pro-

[1] U. S. Dept. Agr., Farmers' Bul. 522, p. 20.

trading, and with the flesh side out. Third, the fleece should be tied with a hard, glazed twine, not larger than one-eighth inch in diameter. In tying the ends of the twine especial care should be taken to make a firm, hard knot that will not slip.

The tied-up fleeces should contain nothing but merchantable wool. Weighty materials, such as bricks, stones, and sheep heads, should not be rolled up in fleeces, and fortunately such instances are relatively few. But tag locks are so common that their presence in fleeces from farm flocks is the rule rather than the exception. The total effect of such a practice is bad. It puts our wools in bad standing with wool houses and manufacturers. Long continued, it has led to the only logical result, namely, discrimination in price against our wools.

Careful rolling, with the flesh side of the fleece out, and no ends or stray locks showing, adds greatly to the appearance of the fleece. It also prevents mixing the wool in different fleeces; and, by the way, each fleece should be tied to itself. In wool warehouses it is a pretty sight to see the heaps of graded wool faced with a tier of carefully rolled and tied fleeces.

TYING TWINE.

The use of wrong kinds of tying twine has caused the manufacturer more trouble than any other one thing, with the wools marketed from the farms of the central and eastern United States. A hard, glazed twine should be used in order to avoid getting any of its fiber mixed with the wool. During the last three or four years paper wool twine has been introduced which is entirely satisfactory to the manufacturer. Rough, loosely woven twine made of vegetable fiber is not desirable, because some of the fiber gets into the wool. It is impossible to remove it. It will not take the dyes used in coloring wool, and it is detrimental to the strength and finish of the cloth. The only way to get rid of it is to pick it out of the finished cloth, which is an expensive process. Sisal twine is the most objectionable of all employed for tying wool. The mills have objected to it so strenuously that its use is being largely discontinued. In no event should it be used; better not tie at all than use it. There have been placed on the market jute products, called wool twine, which are not at all satisfactory. They are so loose and rough that many of the fibers cling to the wool and cause defects in the goods. Undoubtedly the wool trade the world over will institute a war against this type of twine. These so-called wool twines are also unnecessarily heavy. The best wool buyers object to excessive size and length of string. A well-known wool house in the Middle West informed the writer that they had removed more than one pound of twine from a single fleece. The use of so much cheap stuff amounts to unfair packing. It is not necessary to wrap the string more than three times around the fleece—twice is usually sufficient—and the size of the string should be no greater than needed to give it the strength to stand the strain of drawing it in tightly on the wool for the purpose of tying. As stated above, it should not be more than one-eighth inch in diameter. "India" three-ply size No. 44 is a type suitable for tying wool; so are the paper wool twines. Some of the latter, however, are stiff, and therefore difficult to tie in a firm, hard knot that will not slip and release the wool. In selecting from them care should be taken to secure a kind that is soft and pliable.

PACKING AND STORING.

When packing, the fleeces of ewes, lambs, rams, and wethers should be packed separately. In small flocks it is hardly advisable to pack them in separate bags,

but they can be separated in the bag by sheets of stiff, strong paper, so that they can be easily sorted at the market. A bag containing a certain kind or kinds of wool should be marked so that its contents are known. Tags and wool from dead sheep should be packed separately. If there are black or gray fleeces, either they should be packed separately or their location should be designated. For example, a bag containing 40 ewe fleeces, 2 of which are black, could be marked as follows: 38 white—2 black.

If the wool is not sold immediately after shearing, it should be stored in a clean, dry place. It should not be left on the bare ground, even though it is placed in bags. It is the better method to store and market wool in bags, as it is the more likely to be kept clean. The bags should be closely woven, so that they will effectively keep out dust and dirt. They should also be of a type that will not shed particles of fiber into the wool. The loosely woven jute bags commonly used are unsatisfactory in neither particular. In Australia the bags or sheets are lined with paper to insure keeping the wool clean.

A recent number of the Monthly Consular and Trade Reports describes a new method of packing and heading the bales in use in Australia by which the twine is prevented from entering the wool.

The demonstrations of the new process seem to have won the approval of the trade, both in Australia and at Bradford. The equipment necessary for the new process is now obtainable by all pastoralists and exporters desirous of using it, and its popularity seems to be gaining steadily. The demonstration of this new process has been one of the most interesting and closely noticed features of recent agricultural shows in Australia.

In packing wool by this new process, packs with prepared heads and loose tops must be used for the purpose. The pack and the loose head are placed in the wool press in the usual way, the packs being cut down 15 inches from the top. No further cutting is required. After the bale is pressed the front and back flaps are thrown temporarily over the bale, and the head is then firmly secured to the bale by two steel skewers, both front and back, at the same position as the stitching is done under the old system. While the bale is in this position it is not necessary to cut down the four corners, even when they project considerably, as when the skewers are released the corners fill up and form a stiff, even surface, making a package much superior to the old bale. The front and back flaps are tacked together in two places across the top of the bale about 8 inches from each side. The side flaps are then brought the usual way, tacked, and lock-stitched, and the skewers may then be released from the bale.

The chief feature of this process is that no twine or string can possibly enter the bale, the only stitching necessary being on the two outside flaps. There is also a great saving of twine, as nine bales can be treated with the same quantity of twine which, under the old system, was used on one bale. Another important feature is that by simply cutting the stitching on two outside flaps the bale is ready for inspection by the wool valuers and buyers.

In England and Scotland the bagging or sheeting is made from selected fiber of the best long hemp, thoroughly scoured after weaving and carefully examined before it is cut up into sheets. We must exhibit the same sort of care if we are to keep pace with these countries in the quality of the product we offer for sale. If the clip is contracted for before it is shorn and immediate delivery is planned, it is not necessary to bag the wool unless at the request of the purchaser. If it is packed in a clean wagon box and a canvas is thrown over the top, it can be delivered in desirable condition.

RETAIL BUYING OF BEEF.[1]

In a previous bulletin of this series[2] market classes and grades of meat were described. An understanding of the meat-trade requirements enables the stockman to judge the carcass yield and the quality of his animals. The breeder, by processes of selection, endeavors to produce a product which shall approach as near as possible an ideal type, and he recognizes the utility of the finished beef product as an important factor in his breeding operations. The practical feeder likewise requires an intimate knowledge of the market requirements of meat, and no doubt serious financial losses have often been experienced through a lack of knowledge of the proper degree of fatness and hence the amount of food required for each class to enable it to be sold to the best advantage. Thus the study of market requirements as to different wholesale cuts of meat has been given prominent yet by no means undue consideration.

As a contrast to this, the study of the relative proportion of the different kinds of meat in the retail cuts and the cost thereof on the basis of actual food value has been given very little attention in spite of its importance, to which the current high prices of beef have added a special significance. As L. D. Hall and A. D. Emmett, of the Illinois station point out, precise knowledge of the final market product into which beef cattle are converted is essential to both the producer and the consumer of beef. The consumers have to deal directly with the market and have occasion almost daily to make use of information concerning the relative values of different retail cuts. To buy meat intelligently it is necessary to know the nature of the cuts, especially with reference to the proportions of lean meat, fat, and bone they contain, and the food value of meat from different parts of the carcass.

A large majority of meat consumers have no knowledge whatever of these matters, but make their selections of meat solely according to habit or fancy. In fact, but little accurate data along this line have hitherto been available to those who wished to buy meats on a rational basis. As a result, a few well-known cuts are greatly in demand, and the remainder of the carcass is a "drug on the market." To such an extreme has this condition developed that a portion of the carcass (loins and ribs), forming only about one-fourth of its weight, represents nearly one-half of its retail cost. In view of the large place which meat occupies in the American diet, amounting to nearly one-third of the average expenditure for all food, the importance of an intelligent understanding of the subject on the part of the consumer is readily apparent.

Not only are the foregoing statements true of meat producers and consumers as individuals, but it is highly essential to the entire beef-cattle industry, on the one hand, and the economic welfare of the beef-eating public, on the other, that a more intelligent understanding of the different cuts of meat be acquired

[1] Compiled from Illinois Sta. Bul. 158.

[2] U. S. Dept. Agr., Farmers' Bul. 435, p. 16.

by consumers generally. An increased demand for those portions of the carcass which are now difficult for the butcher to dispose of would contribute largely toward a more stable condition of the trade and thus enable the producer to operate with greater confidence and economy. At the same time it would effect a tremendous saving to the consumer himself by more nearly equalizing the market values of the various cuts and by enabling the retailer to operate with a smaller margin of profit.

In the experiments at the Illinois station, three each of choice and prime steers from the university herd where slaughtered and determinations made of (1) the relative proportions of lean, visible fat, and bone in each of the retail and wholesale cuts of beef; (2) the chemical composition and nutritive value of the boneless meat of the various wholesale cuts; and (3) the net cost to the consumer of the lean, the gross meat, and the food nutrients in each cut at current market prices.

The relative cost of the lean and of the total meat in the straight wholesale cuts at market prices is shown in the following table:

Cost of lean and of total meat in the straight wholesale cuts at market prices.

Straight wholesale cuts.	Wholesale price per pound of cut.	Cost per pound of lean in cut.	Cost per pound of total meat in cut.
	Cents.	*Cents.*	*Cents.*
Loin	18.5	31.6	20.5
Rib	15.0	27.1	17.5
Round	11.5	17.8	13.9
Chuck	9.5	13.7	10.8
Plate	8.0	15.8	8.7
Flank	8.0	22.0	8.0
Fore shank	5.0	10.5	8.4

The net cost per pound of lean is, in general, greatest in the cuts which command the highest prices, and vice versa. The flank is an exception to this rule, and the chuck is more economical in this respect than the plate. Referring to the last column, it is also observed that the more expensive the cut the greater the cost per pound of visible fat and lean combined, the flank being the only exception. From these figures it is apparent that food values of beef cuts do not correspond to their wholesale market prices, and that the cheaper cuts are by far the most economical sources of both lean and fat meat. On the whole, the different cuts vary more widely in net cost of food ingredients than in market price per pound of gross meat. The following discussion tends to confirm these statements.

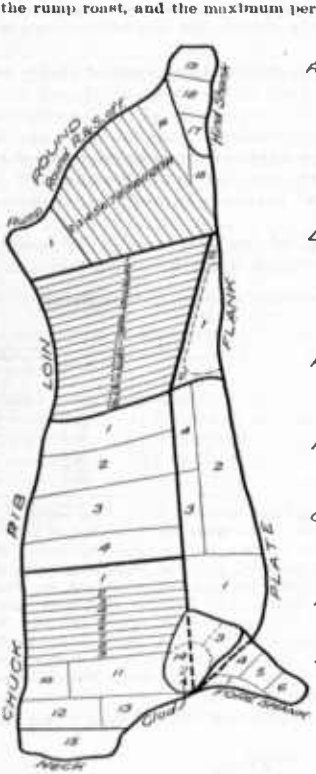
The manner of cutting and the location of the different retail cuts are shown in figure 2.

RETAIL CUTS.

Loin cuts.—Loin steaks averaged 59 per cent lean, 32 per cent visible fat, and 9 per cent bone. Sirloin steaks in general contained a greater proportion of lean and smaller proportion of fat than porterhouse and club steaks.

Rib cuts.—Rib roasts contained, on the average, 55 per cent lean, 30 per cent visible fat, and 15 per cent bone. The greatest percentage of lean was found in the sixth rib roast, and the smallest in the eleventh and twelfth rib cut.

Round cuts.—The various cuts made from the round averaged 65 per cent lean, 18 per cent visible fat, and 17 per cent bone. Round steaks contained 74 to 84 per cent lean, the rump roast 49 per cent, round pot roast 85 per cent, and soup bones 8 to 66 per cent. The maximum percentage of fat was found in the rump roast, and the maximum percentage of bone in the hock soup bone.



HIND QUARTER

ROUND
- Rump
  - 1 Rump
- Round: rump & shank off.
  - 2 Round steak, first cut.
  - 3-13 Round steaks.
  - 14 Round steak, last cut.
  - 15 Knuckle soup bone.
  - 16 Pot roast.
- Hind shank:
  - 17,18 Soup bones.
  - 19 Hock soup bone.

LOIN
- 1 Butt-end sirloin steak.
- 2 Wedge-bone sirloin steak.
- 3, 4 Round-bone sirloin steak.
- 5, 6 Double-bone sirloin steak.
- 7 Hip-bone sirloin steak.
- 8 Hip-bone porterhouse steak.
- 9-15 Regular porterhouse steak.
- 16-18 Club steaks.

FLANK
- 1 Flank steak.
- 2 Stew.

FORE QUARTER

RIB
- 1 11th & 12th Rib roast.
- 2 9th & 10th Rib roast.
- 3 7th & 8th Rib roast.
- 4 6th Rib roast.

CHUCK
- 1 5th Rib roast.
- 2-9 Chuck steaks.
- 10-13 Pot roasts.
- 14 Clod.
- 15 Neck.

PLATE
- 1 Brisket.
- 2 Navel.
- 3, 4 Rib ends.

FORE SHANK
- 1 Stew.
- 2 Knuckle soup bone.
- 3-6 Soup bones.

FIG. 2.—Retail cuts of beef.

Chuck cuts.—These contained an average of 69 per cent lean, 19 per cent fat, and 11 per cent bone. Chuck steaks varied from 62 to 82 per cent lean and from 6 to 22 per cent fat. The shoulder clod contained 80 per cent lean and only 5 per cent bone. Relatively more lean and less fat were found in the chuck rib roast than in those cut from the prime rib.

Plate cuts.—The brisket, navel, and rib ends averaged 51 per cent lean, 41 per cent fat, and 8 per cent bone. The brisket and navel were similar in proportions of the different constituents, but the rib ends were slightly higher in percentage of bone and lower in lean.

Flank cuts.—The flank steak contained 83 per cent lean and 16 per cent fat; and the flank stew, 64 per cent lean and 35 per cent fat.

Fore shank cuts.—Soup bones from the fore shank varied from 17 to 69 per cent lean and from 25 to 75 per cent bone. The boneless shank stew contained 83 per cent lean and 17 per cent visible fat.

Retail trimmings.—Trimming the loin steaks reduced their weight 12 per cent, and the trimmings were about four-fifths fat and one-fifth bone. Round and chuck steaks were reduced but 5 per cent in weight by trimming, only fat being taken from the former as a rule and principally bone from the latter. Other cuts that were materially affected by cutting off surplus fat and bone were the rump, shoulder pot roast, and neck.

RELATIVE ECONOMY OF THE VARIOUS RETAIL CUTS.

From the proportions of lean, fat, and bone in the different cuts, their relative economy at retail market prices may be determined. The net cost of lean ment is an approximate index of the relative economy of steaks and roasts, since they are purchased and used primarily for the lean they contain; but in comparing boiling, stewing, and similar ments the cost of gross ment, or fat and lean combined, should be more largely considered, because the fat is more completely utilized, as in the case of meat loaf, hash, Hamburger, and corned beef. Soup bones, being valued for flavoring matter as well as for the nutritive substance they contain, are more difficult to compare with other cuts in respect to relative economy. They vary materially, however, in proportions of edible ment and waste, and should therefore be studied in this connection.

The following table shows the cost of lean and of total meat in the various retail cuts at market prices:

Cost of lean and of total meat in the various retail cuts at market prices.

Retail cuts.	Diagram number (fig. 2).	Retail price per pound of cut.	Cost per pound of lean meat in cut.	Cost per pound of lean and fat meat in cut.
		Cents.	*Cents.*	*Cents.*
Steaks:				
Porterhouse, hip bone	8	25	38.6	28.9
Porterhouse, regular	10	25	40.2	27.2
Club steak	18	20	32.1	22.6
Sirloin, butt end	1	20	25.8	20.6
Sirloin, round bone	3	20	28.3	21.1
Sirloin, double bone	5	20	28.7	22.7
Sirloin, hip bone	7	20	32.3	24.2
Flank steak	1	16	19.3	16.0
Round, first cut	2	15	17.0	15.3
Round, middle cut	6	15	17.3	15.6
Round, last cut	14	15	19.3	16.0
Chuck, first cut	2	12	18.3	14.1
Chuck, last cut	9	12	15.7	13.1
Roasts:				
Prime ribs, first cut	1	20	40.5	22.9
Prime ribs, last cut	4	16	26.1	18.8
Chuck, fifth rib	1	15	22.8	17.3
Rump	1	12	19.4	12.8
Boiling and stewing pieces:				
Round pot roast	16	10	11.6	10.1
Shoulder clod	14	10	12.3	10.6
Shoulder pot roast	11	10	14.3	11.6

Cost of lean and of total meat in the various retail cuts at market prices—Con.

Retail cuts.	Diagram number (fig. 2).	Retail price per pound of cut.	Cost per pound of lean meat in cut.	Cost per pound of lean and fat meat in cut.
Boiling and stewing pieces—Continued.		*Cents.*	*Cents.*	*Cents.*
Rib ends	3	8	16.2	9.2
Brisket	1	8	15.0	8.7
Navel	2	7	12.8	7.7
Flank stew	2	7	10.9	7.7
Fore shank stew	1	7	8.5	7.0
Neck	15	6	8.5	7.0
Soup bones:				
Round, knuckle	2	5	20.3	12.5
Hind shank, middle cut	18	5	7.5	6.3
Hind shank, hock	19	5	62.5	26.6
Fore shank, knuckle	2	5	17.2	12.5
Fore shank, middle cut	4	5	12.5	9.4
Fore shank, end	6	5	28.8	20.9

Taking the net cost of the lean meat as a basis of comparison, we learn from these data that the most expensive steaks at the prices given are the porterhouse cuts, followed by the club, sirloin, flank, round, and chuck steaks. Of the different roasts, the first-cut prime ribs are the most costly in terms of lean meat, and the rump roast is the most economical. The various boiling and stewing pieces furnish lean meat more economically at market prices than either the roasts or steaks, the rib ends and brisket being the dearer cuts of this class, while the neck and shank stews are relatively cheapest. Several of the soup bones are very economical sources of lean meat, particularly the middle cuts of both shanks, and only one of them is extremely expensive even on this basis. In general the wide variation between the various cuts in net cost of lean is remarkable, ranging from 7.5 cents in one of the soup bones to 40.5 cents in a prime rib roast, and up to 62.5 cents in the hock soup bone, the latter, however, being used primarily for its flavoring substance rather than for lean meat. It will be observed, also, that the market prices of the cheaper cuts correspond much more closely to their net cost of lean meat than is true of the higher-priced steaks and roasts.

The net cost per pound of gross meat, or lean and fat combined, varies much less as between the different cuts than does the net cost per pound of lean, because the proportions of total meat are more nearly uniform than the percentages of lean. The various steaks and roasts rank in substantially the same order as to relative economy on this basis as on the basis of lean meat. The rib roasts, however, are considerably more economical as compared with the porterhouse and sirloin steaks when all the edible meat is considered. The rump shows a very low cost per pound of edible meat, due to the large proportion of fat it contains; and a still further difference is noticed in the case of the rib ends, brisket, navel, flank, neck, and several of the soup-bone cuts. The stewing meats are generally the most economical sources of edible meat at these prices, while porterhouse steaks are the most expensive.

On the whole, the data clearly show that the cheaper cuts of beef are by far the most economical sources both of lean and of total edible meat, including fat and lean. * * * No correlation exists between market prices and the proportion of flavoring substances contained in various portions of the carcass, and cooking tests indicate that the proportion of waste and shrinkage is not necessarily greater in the cheaper than in the more expensive cuts. It is evident, therefore, that retail prices of beef cuts are determined chiefly by considera-

tions other than their food value, such as tenderness, grain, color, general appearance, and convenience of cooking. * * *

Relative economy.—There seems to be no relation between market prices and the percentages of fat, protein, extractives, and ash. The cheaper cuts appear to be as valuable and in some cases actually more so than the higher priced cuts from the standpoint of protein and of energy. These statements do not take into account the factors of tenderness nor the influence the degree of fatness may have upon the palatability of cooked meat. In purchasing meat for protein primarily, the neck, shanks, and clod are the most economical cuts; the plate, chuck, flank, and round follow; with the rump, rib, and loin as the most expensive. From the standpoint of fuel value, the flank, plate, neck, and shank cuts are the cheapest, while the rib, loin, and round are the most expensive. Considering both factors, protein and fuel value, and along with these the palatability of the meat for general use the clod, chuck, and plate are the most economical cuts at the retail prices given.

TOBACCO DIPS FOR SHEEP SCAB.[1]

The Kentucky station, in cooperation with the Bureau of Animal Industry of this department, has made a series of experiments to determine "whether or not it is necessary to use sulphur with tobacco dips in the dipping of scabby sheep in order to effect a cure." The addition of sulphur increases the cost. "Therefore if the sulphur could be omitted and the dip still be effective, it would in the aggregate save a large sum of money yearly to the users of tobacco dips."

The results of these experiments, which were confirmed by those of subsequent dipping tests by the Bureau of Animal Industry on the western ranges under field conditions, indicated no benefit from the addition of sulphur to the nicotin solutions used (0.05 and 0.07 per cent nicotin).

SEWAGE DISPOSAL FOR RURAL HOMES.[2]

In modern sewage purification the process is partly mechanical and partly bacterial, consisting of preliminary or tank treatment and of final treatment which is the application to a natural soil by surface or subsurface distribution or to a specially prepared filter.

As stated by Prof. Anson Marston, of the Engineering Experiment Station at Ames, Iowa, the solid matter in sewage is allowed to settle out in a sewage tank and is there partially destroyed and liquefied by facultative and anaerobic bacteria, which also slightly affect the dissolved organic matter. The effluent from the tank is then filtered or allowed to pass through surface or subsurface distributing pipes in natural soil, in which processes the aerobic bacteria carry on the work of purification. To make conditions most favorable for bacterial action the sewage in the tank should be entirely at rest and light and air should be excluded, and since in the filters or dis-

[1] Compiled from Kentucky Sta. Bul. 157.

[2] Compiled from Iowa Engin. Sta. Bul. 6; Kansas Sta. Bul. 143; Missouri Engin. Sta. Bul. 3; Wisconsin Sta. Circ. 34; Bul. N. C. Bd. Health, 27 (1912), No. 4.

tributing systems the aerobic bacteria must be supplied with air, it is necessary that the discharge of effluent from the tank be intermittent.

The investigations of C. A. Ocock and W. H. Wright, of the Agricultural Experiment Station at Madison, Wis., of W. C. Davidson, of the Engineering Experiment Station at Columbia, Mo., of Oscar Erf, of the Agricultural Experiment Station at Manhattan, Kans., and of W. H. Booker, of the North Carolina Board of Health, indicate that in the design of the settling compartment of a private septic tank a capacity should be allowed of from 5 to 15 cubic feet, or 40 to 80 gallons per person served, depending somewhat on the quantity of water used. Two compartments are necessary for satisfactory service, one for receiving the sewage, and in which sedimentation, bacterial action, and the liquefying process take place, and the other serving merely as a discharge chamber in which the automatic siphon is placed. The capacity of the settling chamber should approach the larger limit in order that it may hold from 24 to 36 hours of sewage. The discharge chamber should be of such capacity and the automatic siphon so adjusted as to cause a discharge about every 12 hours. In arranging this accurate data should be obtained from manufacturers of automatic siphons regarding the adjustment, discharge depths, and discharge capacities of siphons in order that the discharge chamber be built at the proper depth and capacity to discharge the required quantity at the stated intervals. The tank should be constructed as nearly water-tight as possible, preferably of concrete, and some means should be provided at the bottom to facilitate the cleaning out of the settled sludge. The inlet should be provided with an elbow so as to discharge below the water line and the escape pipe in the partition wall should be arranged in the same way. Where the flow is very strong baffle boards or walls should be arranged before these openings to retard the current. The tank should be at least 175 feet away from the house, and the sewer from house to tank should be of vitrified sewer pipe with carefully cemented joints and laid to a grade of not less than 1 foot in 100 feet.

Figure 3 is a design of a septic tank submitted by W. C. Davidson, of the Missouri Engineering Experiment Station, which is large enough to provide for the sewage disposal of a family of six. This tank is suited to conditions where plenty of fall is available for the outlet.

The bill of material for the above septic tank is as follows:

Cement, 22 sacks.
175 feet 4-inch vitrified clay pipe for the sewer from house to tank and for outlet.
10 feet 3-inch vitrified clay pipe.
Automatic siphon.

The necessary sand and gravel can usually be obtained from nearby creeks. When the excavation is made the outside wall may be used for the outside form for the concrete.

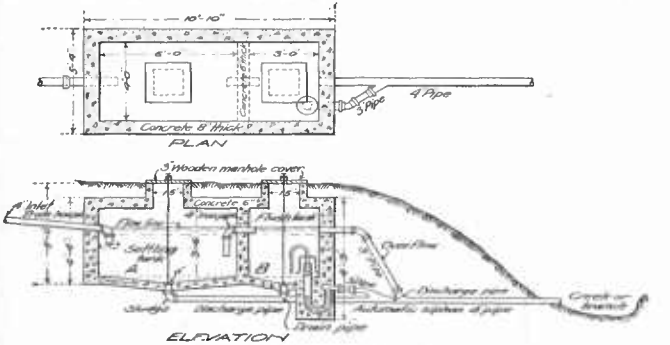


FIG. 3.—Small concrete septic tank.

Figure 4 is a design of a septic tank submitted by Messrs. Ocock

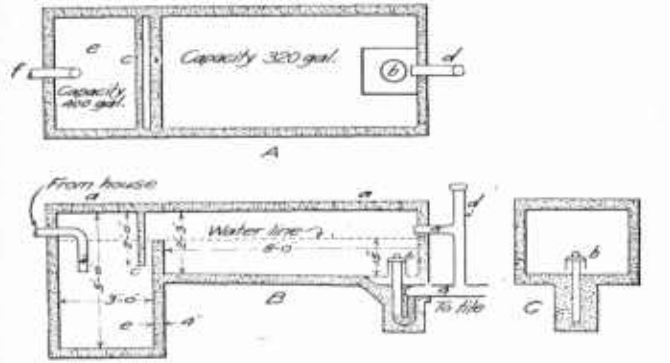


FIG. 4.—Double-chamber tank for a seven-room house.

and Wright which is suitable for a family of about six. It will be noted that the floor of the discharge chamber in this design is considerably above the floor of the settling chamber. This design is

particularly suited to flat ground where outlet fall is difficult to obtain.

The bill of material for this septic tank is as follows:

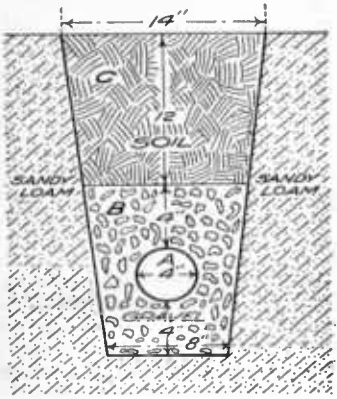


FIG. 5.—Cross-section of a single-tile system.

Cement, 5.5 barrels.
Sand, 2 cubic yards.
Gravel, 3 cubic yards.
Reenforcing steel.
Iron pipe for vent.
Automatic siphon.

The proportions of the concrete in these tanks may vary from 1 part cement, 2 parts sand and 4 parts gravel, to 1 part cement to 2 parts sand to 6 parts gravel.

The disposal system for subsurface distribution of the tank effluent is described by Messrs. Cocck and Wright as follows: The system consists of tile so laid that the liquid sewage is quickly absorbed by the soil when intermittently discharged from the tank. The disposal tile as shown in figure 5 should be placed in the ground not deeper than 14 inches to 16 inches from the surface of the soil to the top of the tile. Aeration of heavy

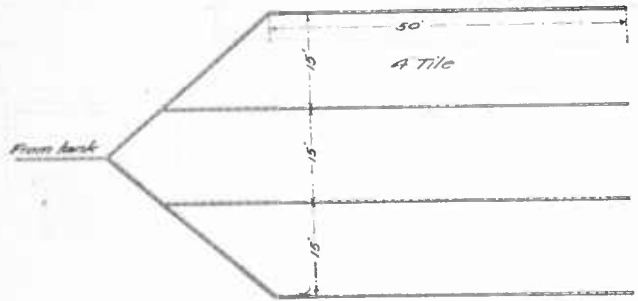


FIG. 6.—Ground plan of absorption system.

soils can be brought about by the use of coarse cinders or gravel laid in 12-inch to 16-inch layers in the bottom of the tile ditch, with the top about 12 inches below the surface. The disposal tile

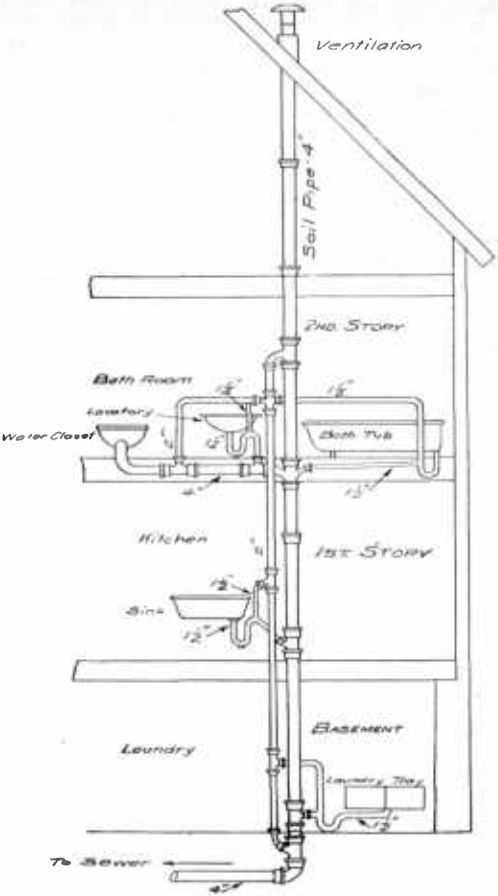


FIG. 7.—Plumbing system for sewage disposal.

should have a fall not to exceed 1 inch in 50 feet, else the water will all rush to the lower end, and in a short time the soil will become waterlogged there. The tile used are the ordinary 4-inch drain tile, laid about one-fourth inch apart. One foot of tile should be provided for every gallon of water discharged into the system, but for heavy soils 2 feet of tile per gallon should be provided to give the best results. Figure 6 shows the ground plan of such a system. About 325 to 400 tile are required with gravel and cinders for a family of six.

The house plumbing should be carefully done, and an experienced plumber should be employed for this work. Figure 7 is a design for the house sewer plumbing submitted by W. C. Davidson of the Missouri Engineering Experiment Station.

The prices for materials will vary in different localities.